

What is
Geoscience
Australia doing?

What is
groundwater?

How do you find
groundwater?

Groundwater in Australia – a hidden resource

Laura Gow

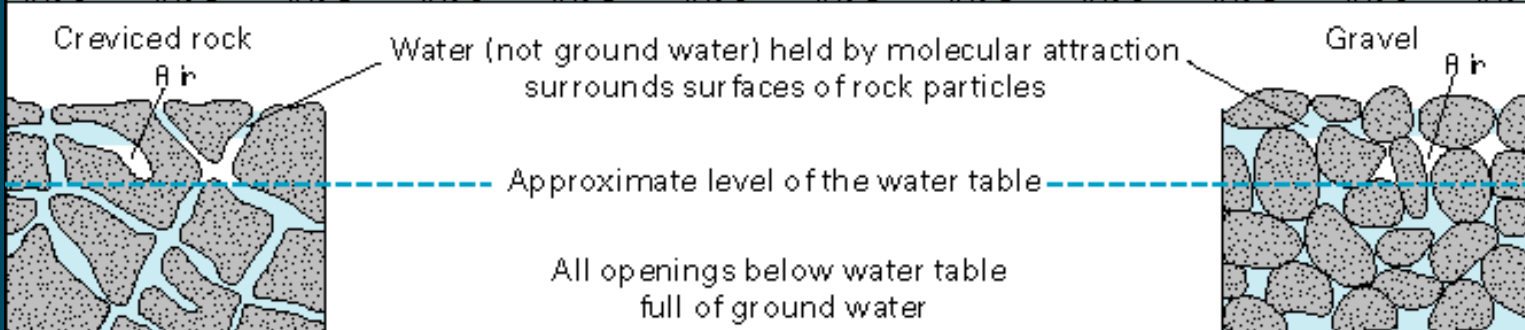
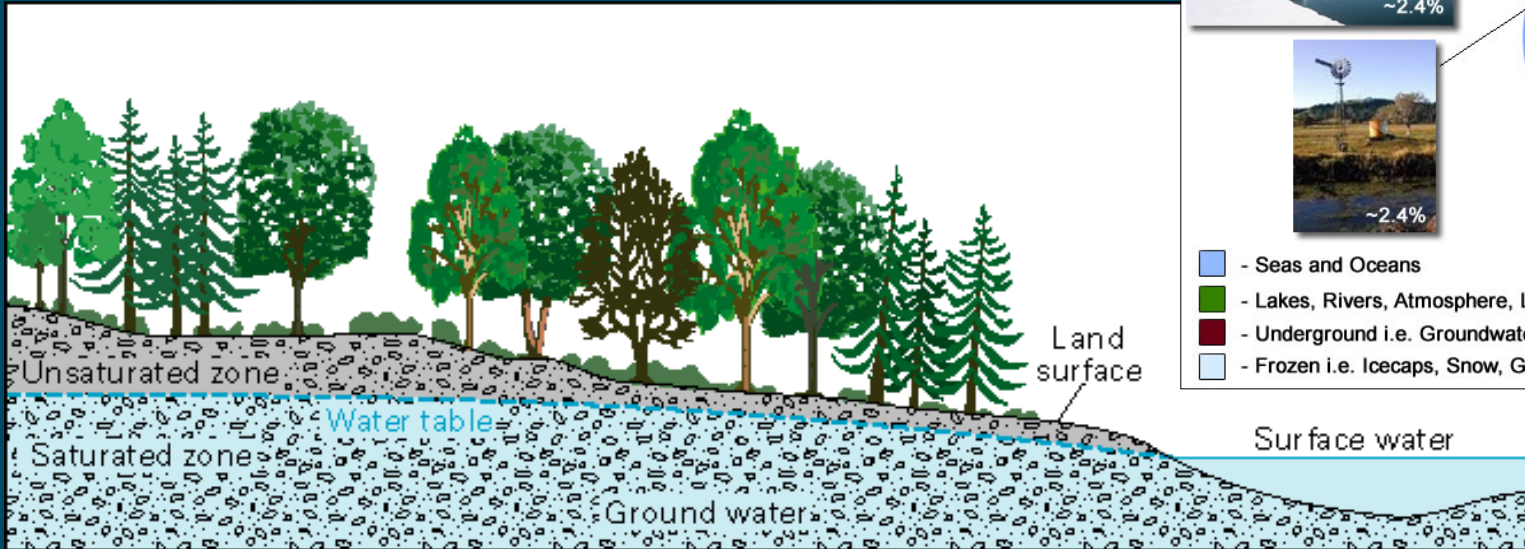
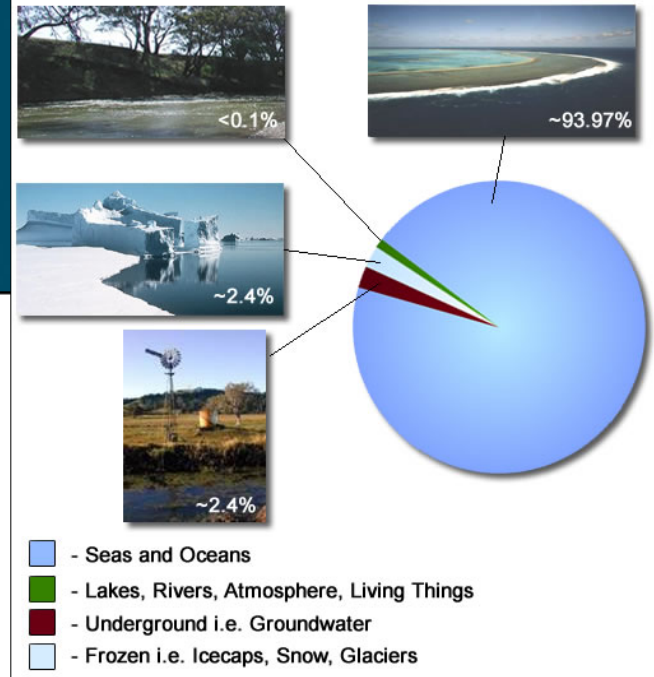
How does
groundwater
occur?

How do we use
groundwater
sustainably?

How important is
groundwater in
Australia?

What is groundwater?

Global Water Resources



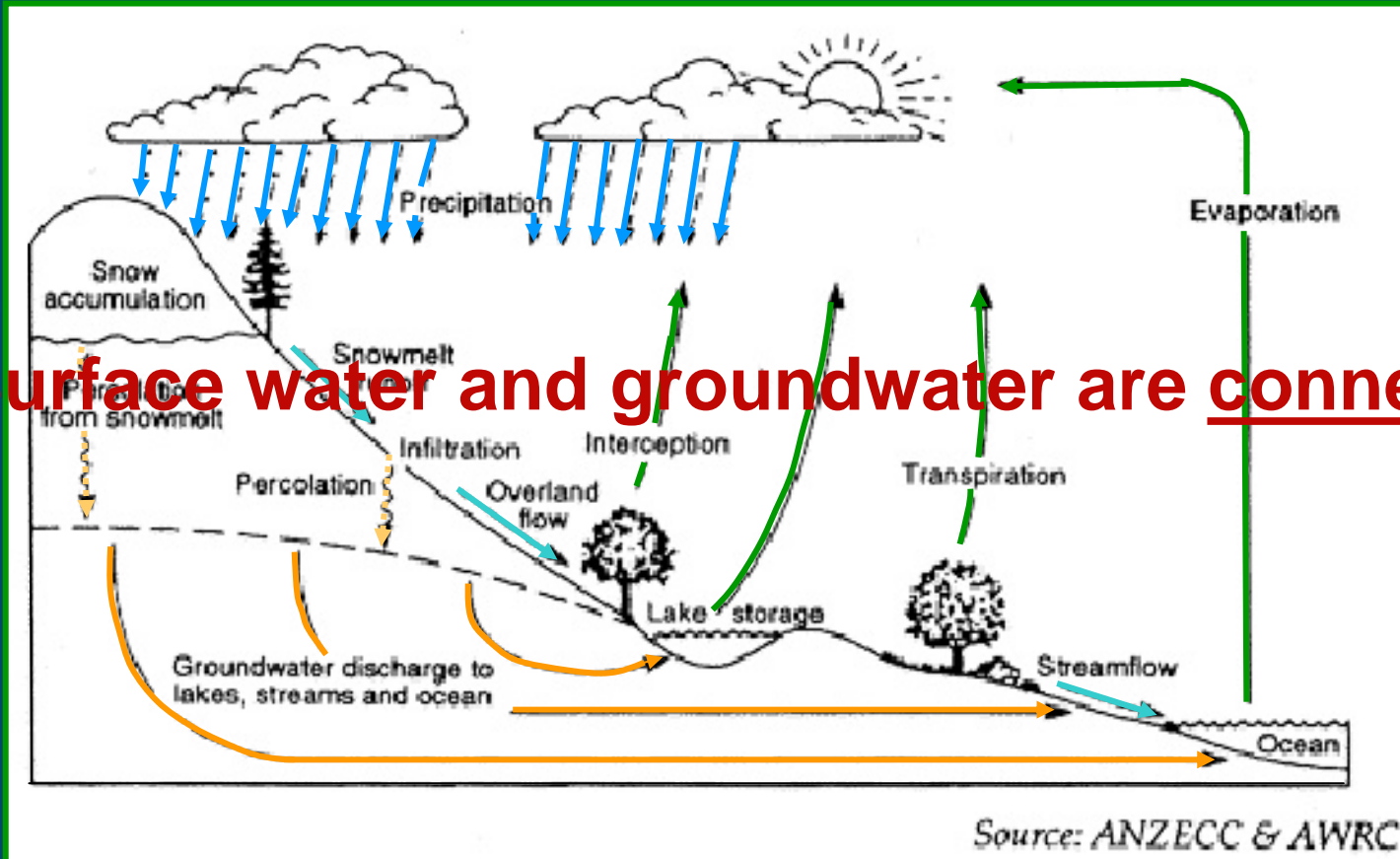
From the US Geological Survey www.ga.water.usgs.gov/edu/pictures/gwaquiferflow.gif

What is groundwater - different aquifer types across Australia

- **Alluvial sediments** – river deposits of sand, silt, clay
- **Palaeochannels** – linear, alluvial deposits formed by ancient rivers that are no longer active.
- **Sedimentary Basins** - large areas with thick layers of sedimentary rocks (such as sandstone, siltstone, conglomerate).
- **Coastal Sands** – sand deposits formed along the coast by wind and water.
- **Fractured Rocks** - otherwise hard and impermeable rocks (such as granites) containing fractures and fissures.
- **Karst** - limestone or dolomite rocks where water dissolution has formed fissures, sinkholes and caves.

How groundwater occurs

Surface water and groundwater are connected



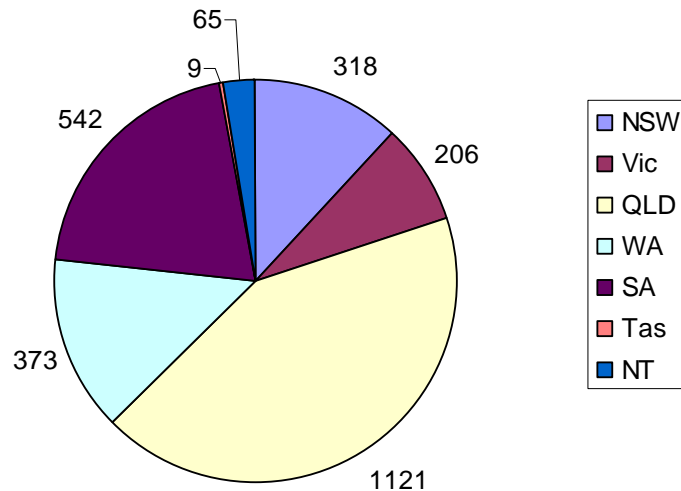
(from the **Connected Waters** website
<http://www.connectedwater.gov.au/processes/hydrological.html>)

How important is groundwater in Australia?

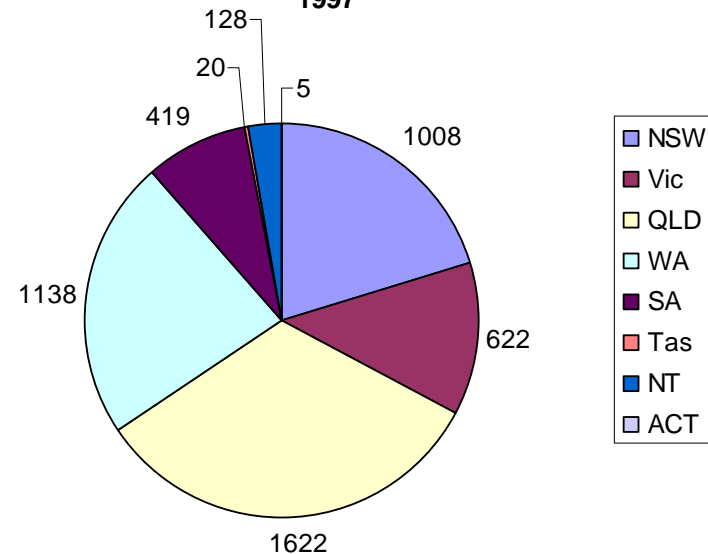
- Groundwater is everywhere but not always of good quality or easily accessible.
- Groundwater makes up approximately 17% of Australia's accessible water resources and accounts for over 30% of our total water consumption.

Who uses groundwater?

Total groundwater use (GL) in Australia:
1983-1984



Total groundwater use (GL) in Australia: 1996-
1997



Source: National Land and Water Resources Audit, 2001

- Major users – QLD, SA, WA, NSW and Vic.
- SA, NSW & Vic use 60% for irrigation; WA uses 72% for urban and industrial.
- Groundwater use has increased Australia wide
 - 2600 GL/yr in 1983/4
 - 5000 GL/yr in 1996/7
 - ~6000-8000 GL/yr in 2009

How useful is groundwater?

- Groundwater is used for urban and rural irrigation, industrial purposes, human and stock consumption, mining processes and supports unique ecosystems.
- It can occur even where there is little available rainfall or surface water and isn't subject to evaporation.
- Groundwater quality can vary from almost as fresh as rainwater, to saltier than the sea.
- Groundwater can also contain chemicals from dissolved minerals.



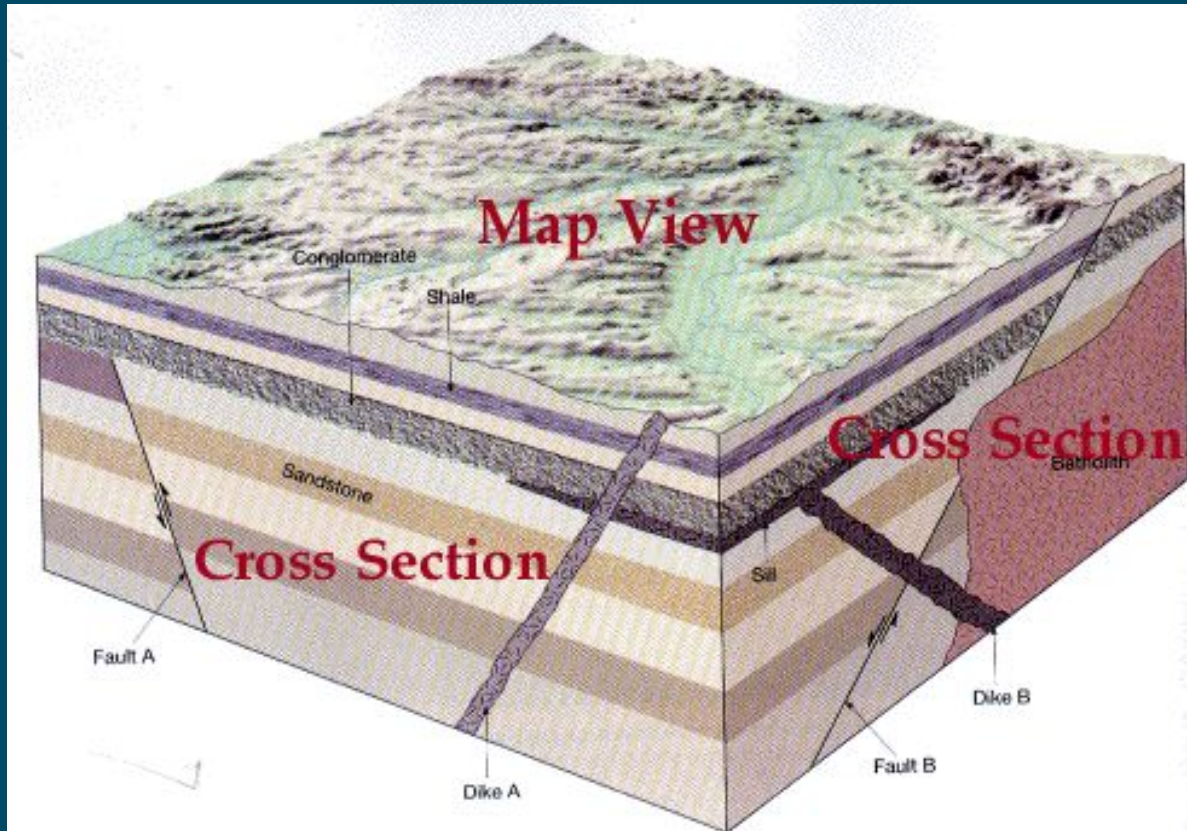
How do we find this hidden resource?

Tools to assess groundwater resources

- Geological data
- Geophysics e.g. gravity, seismic, AEM
- Satellite imagery e.g. Landsat, NOAA, DEM
- Drilling
- 2D/3D modelling

How do we find this hidden resource?

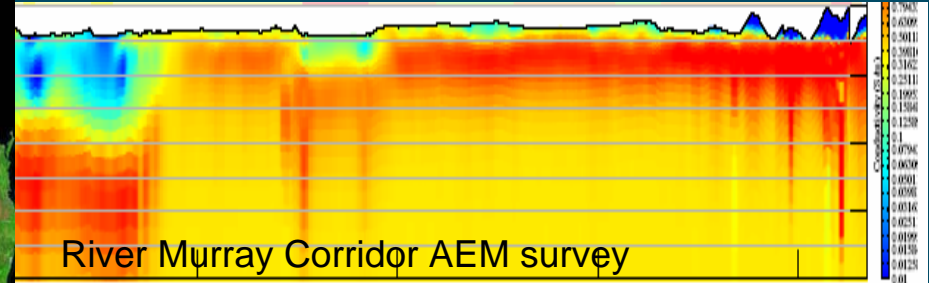
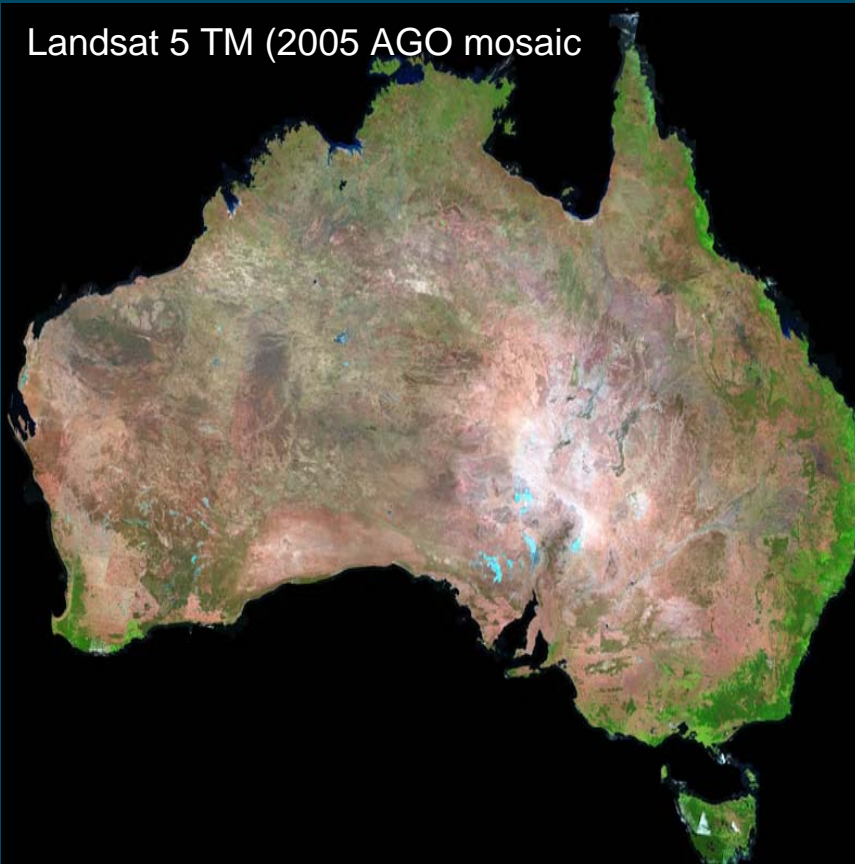
- Geological information can give us useful clues as to where the best place to look might be....eg porous rocks



How do we find this hidden resource?

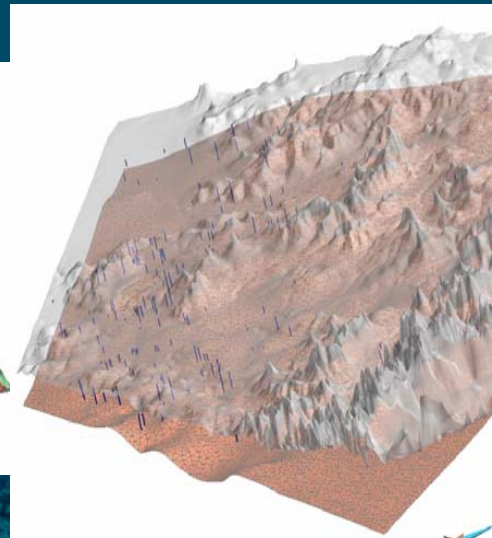
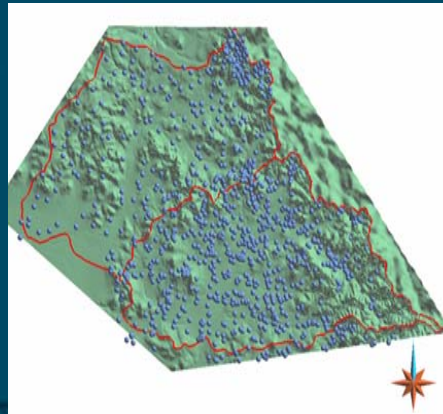
- Geophysics and satellite imagery, combined with geological data are useful in targeting drilling.

Landsat 5 TM (2005 AGO mosaic)



How do we find this hidden resource?

- Drilling boreholes enables us to find out more about the geology and the groundwater at given points
- Borehole information and geophysical data can also help us develop 2D and 3D ideas about the rocks and groundwater
- Mathematical models and chemical information can help us understand and predict the behaviour of groundwater



From a 3D mapping project undertaken for the Condamine Alliance, QLD

Sustainable groundwater use

- **Groundwater is a finite resource!**
- Some groundwater resources may have been recharged long ago under much wetter climatic regimes that can't be recreated today.
- **When groundwater abstraction exceeds the average rate of recharge then groundwater use is not considered to be sustainable ("mining").**
Just because it's there doesn't mean we can exploit it without regard for the consequences.
- Long residence times of groundwater means that the effects of over-extraction can be felt well after abstraction ceases.
- Over-extraction can also result in the reduction of groundwater quality.

Can groundwater resources solve our water crisis?

- In some places groundwater already plays a critical role in providing water resources
- In other places groundwater has the potential to:
 - *augment existing water resources;*
 - *provide a new water resource;*
 - *provide alternative water storage facilities.*
- In many places we don't know enough about groundwater.
- In all places there is only a finite annual total water supply and unless this is regularly replenished we will end up mining our groundwater resources and/or degrading our surface waters

Current groundwater projects at Geoscience Australia

- Identification of new groundwater resources, improved management of current resources and better understanding of groundwater processes in Australia:
 - Identify palaeovalleys and associated groundwater resources for arid Australia;
 - Investigating alternative water sources for Broken Hill, including Managed Aquifer Recharge (MAR);
 - Aquifer mapping using airborne geophysics;
 - Sustainable management of coastal sands aquifers;
 - Assessment of groundwater impacts from mining operations;
 - Using groundwater to detect/monitor CO₂ seepage;

Thankyou for listening

